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Evaluation of different Organics, Chemicals and Growth Regulators for Germination and Seed Priming Methods for Improvement of Seed Quality Parameters in Cucumber (*Cucumis sativus* L.)

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ABSTRACT: Seed germination is controlled by many environmental factors and natural conditions, which in turn affect seedling establishment. Seeds are often placed under certain conditions unfavourable for germination. Although seed priming is a practical method, which can improving synchronize seed germination and increase seed vigour, leads to better crop establishment. Current experiment conducted in the year 2021 to evaluate the performance of different seed priming treatments for improving seed quality parameters in cucumber. The study was carried out in the seed testing laboratory of department of Genetics and Plant Breeding, SHUATS, Prayagraj with the thirteen treatments as Panchagavya, Jeevamruth, KH_2PO_4, NaCl, Gibberellic Acid and Beejamruth of varying concentrations. Experimentation was carried out by using Complete Randomized Design with four replications by roll towel paper method under controlled climatic condition. The current research highlights issues related to germination and seedling growth. Results show that the treatment T_4- Jeevamruth at 10% for 8 hours recorded highest in seed germination percentage 92.75%, shoot length 20.84, root length 13.33cm, Dry weight 0.27g and seed vigour indices 3082.29 and 22.82 respectively. Priming with Panchagavya, Gibberellic acid, KH_2PO_4 and NaCl were not found so effective in enhancing seed quality parameters of cucumber and its effect was recorded close to that of untreated control. Jeevamruth contains the growth regulators for proper seed germination *viz.*, IAA, Kinetin, GA_3 and beneficial microbes provides the nutritional balance to the seeds and reduces the number of abnormal seedlings that is prime requirement for quality seed.

Keywords: Beejamrutha, Cucumber, Growth regulators, Jeevamruth, Panchagavya, Seed quality.

INTRODUCTION

Cucumber (*Cucumis sativus* L.), also known by various Indian local names kheera (Hindi), Kakkari (Malayalam), Vellarikkai (Tamil), Keira (Telugu), Family Cucurbitaceae is an important summer vegetable crop grown all over India. Cucumber originated in north-western India, where it has been cultivated for 3,000 years. Cucumber belongs to the genus Cucumis, of which 20 to 25 species are mostly found in Asia and Africa. It is the fourth most important vegetable crop in Asia after the tomato, cabbage and onion and the second most important vegetable in Western Europe after the tomato (Ene *et al.*, 2016).

Cucumber is a warm season plant and grows well between 65ºF and 75ºF. Plants do not tolerate temperatures below 55ºF or higher than 90ºF (Ngouajio *et al.*, 2006). It is very sensitive to cold temperatures and can be killed at 1ºC with minimum germination temperature 16ºC, maximum germination range 16ºC to 35ºC.

High-quality seeds play an important role in a successful crop production program. Rapid germination and emergence necessary for successful crop establishment for any seed priming plays an important role. Reducing the time from seed priming advertised as simple and effective sowing to emergence under optimal and mitigation conditions such as low temperature pressure (Mavi and Atak 2016).

Seed priming is a strategy to influence seed growth modulating pre-germination metabolic activity the emergence of radicals and usually rapid growth, uniform emergence and plant development to achieve high levels yields (Shakuntala *et al.*, 2020).

The benefits of priming are reduced by the time it takes for germination. Increases germination rate. Helps uniform and rapid emergence. Helps to compete with crops Weeds more effectively. Reduces the amount of fungi that can be transmitted through seeds (Wajid *et al.*, 2021).

Organic seed priming, i.e. treatment with Panchagavya, Beejamrita, and Botanical, provides high temperature and low moisture resistance in the semi-arid tropics. It promotes faster germination, higher seedling vigour and as a result increases crop productivity, especially in developed countries (Elumalai *et al.,* 2013).

Panchagavya is rich in biotic and abiotic stress conditions with the help of macro and micro nutrients required for crop growth. When used as a priming agent, in addition to providing essential nutrients, it also reduces fungal pathogens (Balasubramaniyan and Eeshwari 2019).

GA3 is involved in improved seed germination, root growth, stem extension and water and nutrient uptake. Seed treatments before GA3 seeding are highly effective for seedling growth and nutrient uptake (Bai *et al.,* 2016).

Priming with sodium chloride increases germination performance in many plant species under salinity stress conditions. It is mostly grown in the soil salinity of the technique has been developed to deal with situations (Siva Subramaniam *et al.,* 2004).

Therefore, this study was conducted to research different priming agents for optimal condition to improve seed quality in a short period. Priming improves germination %, germination speed, germination uniformity, resistance to water and temperature stress and increases yield. These differences are greatest in the adverse environmental conditions of the field in cold or hot soils.

MATERIAL AND METHOD

The current experiment was conducted in 2021 at the Postgraduate Seed Testing Laboratory Department of Genetics and Plant Breeding, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences. The current study includes 13 (12 + 1) organic treatments, plant growth regulators and chemicals of various concentrations that should be used to soak cucumber seeds before sowing at the right time. Thirteen different treatments T0-control, T1-Panchagavya 3% for 8 hours, T2-Panchagavya 5% for 8 hours, T3 Jeevamruth 5% for 8 hours, T4-Jeevamruth 10% for 8 hours, T5-KH_2 PO_4 5ml for 8 hours, T6-KH_2PO_4 10ml for 8 hours, T7-NaCl 1ml for 8 hours, T8-NaCl 3ml for 8 hours T9-gibberellic acid 50 ppm for 8 hours T10-gibberellic acid 100 ppm for 8 hours, T11-Beejamrutha 5% for 8 hours T12-Beejamrutha 10% for 8 hours. The seeds are soaked for a respectable period in the prepared therapeutic solutions, then the solution is removed from the beaker and the purified seeds are dried in air to retain its original weight. 100 seeds were placed in four replications on germination paper, with 100 seeds per day using the roll towel method in an upright position in the germination chamber with 20 ± 5°C at 95% relative humidity for 7 days (ISTA, 2012). Current experiment conducted on Completely Randomized Design. Recorded Quality parameters such as germination percentage, shoot length (cm), root length (cm), seedling length (cm), dry weight (g), and vigour index are assessed. Lab experiment data analysis was done by one way ANOVA according to the procedure of Completely Randomized Design (Fisher, 1970).

RESULT AND DISCUSSION

Germination (%): Among the treatments Table 1, germination % was highest at 92.75% with treatment T_4- Jeevamruth 10% for 8 hours recorded, and the lowest germination % with untreated control (T_0) was recorded 72.25 %. The treatment T_{12} – Beejamurth at 10% for 8 hours recorded 91.25 % germination and was found to be at par with the T_4- Jeevamruth at 10%.

Root length and shoot length (cm): Maximum root length (cm) was recorded with the treatment T_4- Jeevamruth at 10% for 8 hours of 13.33 cm and the minimum root length of 7.08 cm was recorded with the untreated control (T_0). Highest shoot length (cm) of 20.84 cm was recorded with T_4- Jeevamruth at 10% for 8 hours and the minimum shoot length of 12.15 cm was recorded with the untreated control (T_0).

Seedling length (cm): Maximum seedling length (cm) was recorded with the treatment T_4- Jeevamruth at 10% for 8 hours of 34.95 cm and the minimum root length of 19.12 cm was recorded with the untreated control (T_0) respectively.

Seedling fresh weight and dry weight (g) : Among the treatments seedling fresh weight (g) was highest recorded 4.46 g with the treatment T_4- Jeevamruth at 10% for 8 hours and the lowest fresh weight of 2.38 g was recorded with the untreated control (T_0); maximum seedling dry weight (g) was recorded 0.27 g with the treatment T_4- Jeevamruth at 10% for 8 hours and the minimum dry weight of 0.18 g was recorded with the untreated control (T_0) respectively.

Seedling vigour index- I & II: The highest seedling Vigour index-I was highest recorded 3168.77with the treatment T_4- Jeevamruth at 10% for 8 hours of and the lowest seedling vigour index-I of 1389.62 was recorded with the untreated control (T_0); maximum seedling vigour index-II was recorded with the treatment T_4- Jeevamruth at 10% for 8 hours of 24.57 and the minimum seedling vigour index-II of 12.63 was recorded with the untreated control (T_0) respectively. Similar findings observe by Sowmya *et al.,* (2013).

Discussion: Primary seeds germinate early and under optimal conditions continue to germinate at high levels throughout the germination period. Seeds were significantly smaller than each organic primary seed in the emergence test (Mavi and Atak 2016).

Results show that the treatment T_4- Jeevamruth at 10% for 8 hours concentration highest in seed germination percentagewas highest at 92.75% with treatment T_4- Jeevamruth 10% for 8 hours recorded, Jeevamruth contains the growth regulators for proper seed germination *viz.,* IAA, Kinetin, GA_3 and beneficial microbes provides the nutritional balance to the seeds and reduces the number of abnormal seedlings that is prime requirement for quality seed (Subha *et al.,* 2017; Elumalai *et al.,* 2013).

Table 1: Influence of seed priming with organics, chemicals and growth regulators on seed quality parameters of cucumber (*Cucumis sativus* L.).

Sr. No.	Treatments	Germination (%)	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Seedling fresh weight (g)	Seedling dry weight (g)	Seedling vigour index -I	Seedling vigour index -II
1.	T0	72.25	7.08	12.15	19.12	2.38	0.18	1389.62	12.63
2.	T1	83.00	11.13	17.30	28.65	3.49	0.23	2359.47	18.69
3.	T2	84.75	11.40	17.37	29.02	3.55	0.24	2438.36	20.35
4.	T3	87.00	12.79	19.80	32.40	4.05	0.25	2834.04	21.29
5.	T4	92.75	13.33	20.84	34.48	4.46	0.27	3168.77	24.57
6.	T5	83.25	8.28	15.51	23.96	3.61	0.23	1979.63	19.14
7.	T6	83.00	8.53	15.90	24.32	3.71	0.25	2027.12	20.33
8.	T7	77.50	7.58	14.10	21.83	2.78	0.22	1680.57	17.22
9.	T8	73.25	7.40	13.09	20.62	2.60	0.23	1500.84	16.48
10.	T9	82.25	9.44	16.08	26.12	3.50	0.24	2098.98	19.77
11	T10	84.50	10.37	16.31	27.25	3.66	0.26	2255.26	21.73
12.	T11	86.25	12.20	18.50	30.88	4.02	0.24	2646.97	20.49
13.	T_{12}	91.25	13.36	20.42	34.95	4.18	0.25	3082.29	22.82
Grand Mean		**83.15**	**10.22**	**16.72**	**27.20**	**3.54**	**0.24**	**2266.30**	**19.65**
F test		S	S	S	S	S	S	NS	S
SE (M)		1.128	0.090	0.156	0.183	0.043	0.009	35.048	0.681
C.V.		2.735	1.803	1.898	1.389	2.446	6.624	3.189	7.029
C.D. at 5%		3.249	0.259	0.449	0.528	0.123	0.025	76.627	1.962

Whereas "S" Significant , "NS" Non Significant

Maximum seedling lengthwas recorded with the treatment T_4- Jeevamruth at 10% for 8 hours of 34.95 cm, increase in seedling length because of cow dung and cow urine provide nutrients for seeds, which provide good germination, seedling growth. Seedling fresh weight (g) was highest recorded 4.46 g with the treatment T_4- Jeevamruth at 10% for 8 hours, maximum seedling dry weight (g) was recorded 0.27 g with the treatment T_4-Jeevamruth at 10% for 8 hours and seed vigour indices. This should be due to their composition by plant and animal products that have anti-pathogenic properties. It protects the seeds from the pathogens that spread through the seeds, which affects them during the germination process. Jeevamruth contains a variety of microorganisms that enhance germination (Singh and Lal 2018).

Increased implementation of seed treatment with Beejamrutha contains domestic cow dung, cow urine and other components such as soil, water and lime. Germination is enhanced by the presence of beneficial microorganisms such as bacteria, yeasts, fungi and actinomycetes and contains many vitamins, amino acids and macro & micro nutrients and growth- inducing hormones like gibberellic acid (GA3), Indole Acetic Acid (IAA) (Sreenivasa *et al*., 2009) and it will make crop healthy and free from seed-borne diseases.

Seed germination due to Panchagvya contains growth-promoting hormones such as gibberellic acid (GA3) and abscisic acid (ABA). Indole acetic acid (IAA) (Jain *et al*., 2013).

Panchagavya treatment includes micronutrients, macronutrients, many vitamins, essential amino acids, growth promoting factors and beneficial microorganisms (Dhasarathan *et al.,* 2018).

Priming of GA3 stimulates germination of sprouts, enhances growth, activates enzymes. (Anwar *et al.*, 2020). These findings suggest that GA3 is an important plant hormone that activates various growth processes during plant growth

CONCLUSION

Judging by the positive results obtained from the study, priming of cucumber seeds germinate early and maintain a high level of germination throughout the germination period. Seeds with the treatment T_4- Jeevamruth at 10% for 8 hours found to be promising with maximum germination of 92.75%, 34.95 cm seedling length, 3168.77 seedling vigour indices be recommended for seed priming of cucumber.Similarly, the performance of at par treatment; T_{12}-Beejamurth at 10% for 8 hours performed well with 91.25 germination%, 34.48 cm seedling length 0.25 g dry weight and vigour indices of 3082.29 and 22.82 respectively. From the result, it can be concluded that seed priming is an alternate strategy to develop healthy seedlings under adverse conditions to a particular extent; priming with organics, Jeevamruth and Beejamruth were found promising and can be suggested for commercial cultivation.

FUTURE SCOPE

Further experiment needs in field trails to arrive at valid recommendations.

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Conflict of Interest. Nil.

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